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Rajesh Raj and Sanjib Bordoloi and Nalin Bharti

Reserve Bank of India, Reserve Bank of India, Indian Institute of
Technology Patna

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First author	Second author	Third author
Shri Raj Rajesh, Assistant Adviser, Department of Economic & Policy Research, Reserve Bank of India, South Gandhi Maidan, Patna, India. Also a Research Scholar at the Indian Institute Technology, Patna Tel. No. +91-612-2322663 Fax. No.: +91-612-2322663. Mob.: (00) 92043 94822 E-mail: rrajesh@rbi.org.in	Shri Sanjib Bordoloi, Assistant Adviser, Assistant Adviser, Department of Statistics and Information Management, Reserve Bank of India, Bandra Kurla Complex, Mumbai, India. Tel. No. +91-22-26578500 Fax. No.: +91-22-26572319 E-mail: sanjibb@rbi.org.in	Dr. Nalin Bharti, Assistant Professor, School of Humanities and Social Sciences, Indian Institute of Technology Patna, Navin Government Polytechnic College, Patliputra Colony, Patna, India Tel. No. +91- 612 – 2552017. Fax. No. +91-612- 2277383 E-mail: nalinbharti@iitp.ac.in

Assessing the Role of Trade in Transmission of Global Financial Crisis to the Indian Economy

Raj Rajesh¹, Sanjib Bordoloi², Nalin Bharti³

Abstract

Over the past few decades, while trade has contributed significantly to economic growth in various economies including India, openness has also exposed them to vagaries of external shocks. While recent global financial crisis (GFC) essentially originated in advanced economies, it got transmitted to emerging market economies through three main channels viz., financial, trade, and confidence channel. Relatively, while financial channel had a more dominant role in transmitting global shocks to Indian economy, its growing trade openness had led to decline in both exports and imports from the latter half of 2008 till 2009. Against this backdrop, this study primarily focuses on studying the impact of trade shock emanating from GFC on the Indian economy. In empirical analysis, it is found that the impact of recent trade shock on the economy remained minimal and short-lived. Under S-VAR framework (quarterly data from 1996-97 to 2009-10), impulse response analysis suggests that the impact of export demand on India's gross domestic product (GDP) persists for a short while, which is validated by recent strong rebound of the economy in the aftermath of global financial crisis. This is in line with our expectations as GDP growth in India is primarily driven by domestic consumption, while external demand plays a minimal role.

JEL classification: F14, F43, G01

Key words: Trade, Financial Crises, Open economy, India

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² Assistant Adviser, Department of Statistics and Information Management, Reserve Bank of India, Mumbai.

³ Assistant Professor of Economics, Indian Institute of Technology Patna.

I. Introduction:

In the series of financial and currency crises of the 1990s (Mexican crisis, 1994; East Asian crisis, 1997-98; Brazilian crisis, 1999) including the recent global financial crisis, the crises first originated in a country or a region but got transmitted to other economies as a contagion. In all these crises, trade had been an important channel of transmission of crisis to other countries. In the recent *global financial crisis*, three main channels of transmission of crisis to the emerging market economies (EMEs) including India were the *financial channel*, *trade channel*, and *confidence channel*. *Financial channel* caused wild disruptions in the financial markets impacting the equity and money markets badly. *Trade channel* impacted the roots of the real sector causing decline in real economic activity following a decline in production and investment activities, which resulted in unemployment, largely in trade dependent sectors. The *confidence channel* operated through the equity markets, wherein sharp decline in prices of scrips across the board caused decline in business and consumer confidences. In India, all these transmission channels operated; albeit their strengths varied. In the Indian case, financial channel was found to be more dominant as compared to trade channel (RBI, 2010). While the adverse impact of global financial shocks were felt immediately by the Indian economy in mid-2007 as the capital market started jolting, trade sector was not impacted immediately. Rather, the trade channel of the contagion intensified only in the aftermath of collapse of the investment bank – Lehman Brothers – in mid-September 2008. It was at this time that the crisis adversely impacted India's merchandise trade as both exports and imports declined swiftly and substantially.

Of the three channels, the present Study primarily focuses on the role of trade in spreading the contagion of global financial crisis to the Indian economy. This assumes importance as a better understanding of how the trade shock affected the Indian economy would

help policy makers in designing countercyclical policies. The trade channel transmitted the adverse global shocks to the Indian economy both through merchandise trade and services (invisibles) trade. Nevertheless, for the sake of brevity and simplicity, our study is primarily focused on analyzing the trade comprising only the merchandise trade.

Though there is an abundant literature on trade and growth linkages, literature on the area as to how shocks in trade (export) might affect economic growth of a country is scanty. Against this backdrop, this paper seeks to bridge the gap in literature by presenting such an analysis for the Indian economy. Our analysis in this regard has a number of distinctive features differentiating it from earlier studies. First, our study is carried out focusing on a single country – India. Second, our analysis is based on high frequency (quarterly) data, which presents a more realistic assessment of the economy.

The remainder of the paper is organized as follows: Section II presents select literature review. Section III deals with the issue of openness and growing linkage of India's external sector with the global economy. Section IV analyses recent trends in India's merchandise trade. Section V describes how trade acted as a conduit in the transmission of global financial crisis to the Indian economy. Section VI highlights the sectoral impact of contraction in India's trade in respect of select merchandise exportable goods. Section VII carries out empirical analysis. Concluding observations of the paper are set in section VIII.

II. Literature survey

In the empirical literature, the role of trade links in the international transmission of crises has been studied extensively. Despite theoretical ambiguities, some authors have demonstrated that countries trading more intensively also exhibit a higher degree of output co-movement (Frankel and Rose, 1998). On the issue whether trade linkages have been important in

international transmission of crises, literature is divided into three camps. One set of literature argues that international trade linkages were important in transmission of crisis from one country to another (Eichengreen and Rose, 1999). A contrarian set of literature contend that trade linkages have not been important, especially in the spread of some of the past crises, viz. Mexican, Asian, Russian crises (Mason, 1998; Harrigan, 2000). A third strand of literature attaches importance to trade linkages as medium of transmission of crises to other countries but argue that though trade linkages are important, but they are overshadowed by other transmission mechanisms (Akin, 2006). Consolidated literature review on the issue is presented below.

S. No.	Studies	Characteristics of Study	Main Findings
1.	Frankel and Rose (1998)	Empirical estimation	Authors show that trade, and more generally economic integration among countries, can result in increased synchronization of business cycles between individual countries, since trade links serve as a channel for transmission of shocks between countries.
2.	Eichengreen and Rose (1999)	Binary probit model	They studied 20 industrial countries for the period 1959-1993 and supported the idea that trade links rather than macro-economic similarities was the dominant channel for contagious international transmission of shocks.

3.	Forbes (2001)	Empirical estimation for a sample of 58 countries during 16 crises during the period 1994 to 1999.	It establishes that trade linkage is important determinant of a country's vulnerability to crises that originate elsewhere in the world. It explains that trade can transmit crises internationally via three distinct and possible counteracting channels: a competitiveness effect, an income effect, and a cheap import effect.
4.	Glick and Rose (1999)	Sensitivity tests	For understanding the role of trade in the international transmission of crises, the authors focus on five major currency crises between 1971 and 1997 and test if the probability of a country being attacked during a currency crisis is also affected by trade linkages between that country and crisis-hit country. They found that a stronger trade linkage is associated with a higher incidence of currency crises.
5.	Harrigan (2000)	Examines how the Asian crisis affected prices and volumes in different US manufacturing sectors.	He rejected the trade channel and found that the impact of Asian crisis on the US industries was small, localized, and modest.
6.	Masson (1998)	Examined	He categorized trade as a 'spillover' and showed that

		specific channels through which crises spread internationally.	it was not important during the Mexican crisis or the Asian crisis. He argued that since exports to Mexico and Thailand constituted a small proportion of total exports from their neighbours, regional spillover effects through trade would have been modest.
7.	Artis and Okubo, 2011	Re-estimation of the correlation between trade and business cycle synchronization	Author estimate the correlation between trade and business cycle synchronization. Authors find a positive impact of trade on business cycle synchronization particularly in the current wave of globalization, although the inter-war period sees negative impacts. The current economic integration and currency unions also positively affect business cycle synchronization.
8.	Mohanty ,2010	Analysis of the recent global financial crisis and its impact on the Indian economy through three distinct phases since the second	Author argued that despite sound fundamentals and no direct exposure to the sub-prime assets, India was affected by global financial crisis through all the channels – trade, financial and confidence channels – reflecting increasing globalization of the Indian economy than what is apparent in terms of traditional indicators.

		half of 2008-09.	
9.	RBI, 2010	Empirical estimation	It observes that global financial crisis got transmitted to the Indian economy through three channels, viz., finance, trade, and confidence channels. It found that as compared to financial channel had a more dominant role in transmitting the effects of global developments in Indian economy during the crisis period. Using quarterly data from 1996 to 2009, it carried out VAR analysis and the cholesky variance decomposition suggests that about 50 per cent of variation in GDP is explained by financial variables, while exports of goods and services explains about 9 per cent of output variation.
10.	Akin 2006	Simultaneous equations estimation	Author showed that on an average, global financial integration has a positive but weak effect and synchronization increases for country pairs with higher degrees of financial openness. Simultaneous equations estimation shows that there is a strong positive feedback from financial openness as compared to trade integration.

III. Openness of Indian Economy and its Linkages with the Global economy

In the last decade or so, both trade and invisible flows have intensified in the Indian economy. The economy has been more open (Figure 1). Further, there has been a greater synchronisation of domestic business cycle with global cycles. This has resulted in external shocks having a rapid impact on domestic economy.

<Insert Figure 1 here>

With the growing openness of the Indian economy, external demand linkages of the Indian economy have improved substantially. Global GDP has been found to be affecting the India's manufacturing sector exports. It is observed that for most of the period since 1980s, there has been a co-movement of growth in manufacturing exports and global GDP growth (Figure 2). During 1981-82 to 2008-09, a significant correlation of 0.74 was observed between India's manufacturing sector exports and the global GDP growth. Further, for the period - 2006Q1 to 2009Q4 - quarterly growth in India's export nearly seem to track the growth in world exports (Figure 3).

<Insert Figure 2 here>

<Insert Figure 3 here>

The US economy, which has been the powerhouse of the global economy, almost accounts for a quarter of global GDP. Being the major economy of the world and India having substantial trade ties with it, this is but natural that a change in external demand in US economy would have a bearing on India's exports. As expected, quarterly trend of the US economy's import demand and India's export supply from 2006 to 2009 tend to track each other (Figure 4). This clearly suggests that slowdown in the US economy following the global financial turmoil has been one of the primary factors behind the sluggishness of India's export sector.

<Insert Figure 4 here>

IV. Recent Trends in India's merchandise Trade:

Impact of the Global Financial Crisis on India's Trade Sector

In the wake of global financial crisis, export prospects of a larger set of countries suffered. Relative performance of countries on the export front, however, varied significantly. From October 2008 to September 2009⁴, when the global recession had intensified, fall in export growth of the India's exports was lower than the fall in export growth of some of the advanced economies as well as some of the EMEs (Figure 5).

<Insert Figure 5 here>

In the midst of the intensification of the ill-effects of the global financial crisis, India's export sector, which had been growing at a rapid pace in the last couple of years, got a bad hitting with the plummeting of global economic activity, which dried up external demand. During 2008-09, India's merchandise exports witnessed large scale volatility on monthly basis. Though exports remained buoyant during the first half of the year, it declined in the second half of the fiscal (Figure 6). During April-August 2008, exports grew by 35.6 per cent, but it decelerated significantly in September 2008 to 14.2 per cent. During 2008-09 exports decelerated sharply to 3.4 per cent from 29.0 per cent during 2007-08. Exports have posted a decline during October 2008 to September 2009. Decline in India's exports during the period was been in tandem with the deepening of recession in the developed countries.

<Insert Figure 6 here>

Import growth in India also received a setback in the midst of the global financial crisis following moderation in domestic economic activity, decline in exports (which impacted the

⁴ During the chosen period, merchandise export of the Indian economy had declined. Accordingly, a comparison has been drawn with other economies, which witnessed similar trends.

imports of commodities such as gems and jewellery, which are processed and after value addition exported) and softening of crude oil and other commodity prices. Import growth in India decelerated from 35.5 per cent in 2007-08 to 14.3 per cent in 2008-09 owing to sharp deceleration during October and November 2008 and declined thereafter during the period December 2008 to March 2009 (Figure 7). Oil imports, which had increased by 60.0 per cent during April-October 2008 declined by 29.0 per cent during November 2008-March 2009 due to sharp decline in oil prices. Though non-oil imports remained resilient during the first three quarters of 2008-09 (22.7 per cent growth), it declined by 15.3 per cent during Q4 of 2008-09. Trade deficit during 2008-09 showed a substantial expansion to US\$ 119.1 billion from US\$ 88.5 billion in 2007-08.

<Insert Figure 7 here>

V. Transmission of Global Financial Crisis in Indian Economy through Trade Channel

Economic development of an open economy is determined both by domestic and external demand factors. In an economy, export sector is expected to contribute to growth, through *inter alia* better technology and productivity, economies of scale, optimal allocation of resources, research & development, augmentation of demand, *etc.* Basically, foreign trade channel in a country is expected to operate through exports and imports of merchandise goods and tradeable services. While exploring the relationship between exports and GDP growth in an open economy, RBI (2010) found that the impact of exports on GDP growth depends upon the share of exports in domestic demand, and the income (global) elasticity of exports.

Diagrammatical presentation as to how the global financial crisis impacted the Indian economy through the trade channel is presented below (Figure 8). Global financial crisis caused a decline in volume of both exports and imports. Decline in global GDP following the prevalence

of recessionary conditions in major advanced economies caused decline in India's exports. Decline in both exports and imports led to decline in investment demand, which thereby impacted production adversely. Decline in production and investment demand caused joblessness in a number of sectors, which led to a compression in demand for goods and services and this, in turn, affected GDP adversely. Further decline in exports and imports, adversely affected India's GDP through the foreign trade multiplier⁵ channel.

<Insert Figure 8 here>

VI. Sectoral Impact of Trade Channel

Impact on Select Merchandise Exportables

An analysis of commodity-wise exports data for 2009-10 suggests that India's export basket is dominated by manufactured goods (comprising engineering goods, gems & jewellery, chemical products, textile products and) followed by petroleum products and primary products (Table 1).

Table 1: India's Merchandise Exports of Select Items (2009-10)		
Items	Export (US \$ Mn.)	Share in Exports (Per cent)
Agriculture & allied products	17743.5	9.9
Chemicals & related products	22852.7	12.8
Engineering goods	38437.7	21.5
Textile & textile products	19834.9	11.1
Gems & jewellery	28918.8	16.2
Petroleum Products	28131.2	15.7
Others	8925.5	5.0
Source: Handbook of Statistics on Indian economy, 2009-10, RBI.		

⁵ $\Delta Y = \left(\frac{1}{1-c+ct+m} \right) \times [\Delta C + \Delta I + \Delta G + \Delta(X - M)]$, where $\left(\frac{1}{1-c+ct+m} \right)$ is the foreign trade multiplier.

Within the manufactured exports, most of the items witnessed moderation/ degrowth as these sectors were more severely affected by the demand recession in the developed countries reflecting mainly the recessionary conditions in the largest export destination *viz.*, the US economy (Figure 9). Exports of agriculture and allied products as also ores and minerals showed sharp deceleration in export growth in 2008-09 mainly due to the decline in exports of agricultural commodities and ores and minerals following a dramatic decline in commodity prices. Petroleum products exports, which constituted the second largest component of India's exports, witnessed a sharp deceleration in growth both because of the sharp decline in global crude oil prices and recessionary conditions in major export destinations of India. Engineering goods exports, which constitute more than one-fifth of India's total exports, on the contrary, showed resilience and witness de-growth only in few months. Slowdown in India's exports in relatively low technology and labour-intensive sectors, *viz.*, gems and jewellery, textiles and textile products and leather and manufactures had adverse impact on employment in these sectors.

<Insert Figure 9 here>

Impact on Employment

Like other developed economies, global financial crisis caused some job losses in India. As per ILO (2010), in nine months (from October 2008 to June 2009), 8.3 lakh jobs were lost in India in the aftermath of global crisis (Table 2). Despite job losses, since economic activity in India rather than declining just got moderated and there were also creation of newer jobs. As a consequence of this, net job losses during the period were relatively less at 3.7 lakh. Maximum job losses occurred in the textiles, which is highly labour-intensive in the case of Indian economy. The reasons for lesser job losses in the case of Indian economy has been the

implementation of fiscal stimulus packages by the Central Government that hastened the pace of recovery of the economy allowing it to climb back to near pre-crisis levels. Further, various poverty alleviation and employment generation programmes of the Government such as Mahatama Gandhi National Rural Employment Guarantee Scheme (MGNERGS), which guarantees a minimum employment of 100 days to unemployed, worked well to protect the interest of the vulnerable sections of the society.

Table 2: Change in employment in Select Sectors in India (Oct 2008 to June 2009)		
Sectors	Job losses	Net Change in employment
Textiles	-261000	-53000
Leather	-33000	-20000
Metals	-130000	-130000
Automobile	-169000	-144000
Gems & Jewellery	-179000	-146000
Transport	-5000	-1000
IT-BPO	-34000	124000
Handloom, Powerloom	-16000	40000
Total	-827000	-370000
Source: Ministry of Labour and Employment, Govt. of India.		

VII. Empirical Estimation with S-VAR Model

For the empirical estimation, we have used quarterly data from the period 1996Q2 to 2010Q1. We have used the following variables, *viz.* real GDP, total final consumption expenditure (TFCE), gross domestic capital formation (GDCF), exports (EXPORTS), United States of America GDP (USGDP). In the model, variable, DUMMY, has been introduced to differentiate the crisis (recent global financial crisis) period from the non-crisis period. In the pre-crisis time, dummy assumes a value equal to 0, for other period, it is 1. Since quarterly GDP figures for the world or for the OECD countries were not available, we have taken USGDP as a proxy for global GDP. Further, being the largest economy of the world, the US economy almost

accounts for a quarter of global GDP and India has substantial trade ties with the USA and, therefore, it was also found to have influence on India's exports. This validates the use of USGDP data in this case. In our empirical estimation, we use seasonally adjusted data and for the same we use the U.S. census bureau's X12 ARIMA procedure. All the results have been obtained using the E-views 6.0 software. Stationarity of the variables has been checked using the ADF test. All the above set of variables have been found to be first-difference stationary or I (1) using the augmented dickey fuller (ADF) and Phillips Peron (PP) tests (Table 3).

Table 3: Unit Root Test using ADF and Phillips Peron tests					
Variables	Test included	t- value		Appropriate Lag Length	Inference
		Level	First Difference		
ADF Test					
LGDP	Constant	1.51	-8.76***	0	I(1)
LTFCE	Trend and intercept	-0.92	-5.69***	3	I(1)
LGDCF	Trend and intercept	-3.02	-10.99***	0	I(1)
LEXPORTS	Intercept	0.031	-5.40***	0	I(1)
LUSGDP	Intercept	-1.69	-3.51**	0	I(1)
PP Test					
<i>LGDP</i>	<i>Constant</i>	2.09	-8.72***	<i>N.A</i>	<i>I(1)</i>
<i>LTFCE</i>	<i>Trend and intercept</i>	-2.76	-14.74***	<i>N.A</i>	<i>I(1)</i>
<i>LGDCF</i>	<i>Intercept</i>	-0.59	-11.07***	<i>N.A</i>	<i>I(1)</i>
<i>LEXPORTS</i>	<i>Intercept</i>	0.62	-5.22***	<i>N.A</i>	<i>I(1)</i>
<i>LUSGDP</i>	<i>Intercept</i>	-2.02	-3.50**	<i>N.A</i>	<i>I(1)</i>
Notes: ***, ** and * presents significance at 1%, 5% and 10% level of significance, respectively.					

We now estimate S-VAR model, which includes four seasonally adjusted endogenous variables in the following order: real GDP (LGDP), total final consumption expenditure (LTFCE), gross domestic capital formation (LGDCF), exports (LEXPORTS). The ordering of these variables appears reasonable in view of their inter-dependence. The model also includes

two exogenous variables, viz. DUMMY (to capture the impact of global financial crisis on the Indian economy) and USGDP (LUSGDP). The standard structural system can be considered of the following linear and stochastic dynamic form.

$$A_0 Y_t = B(L) Y_{t-1} + \varepsilon_t \quad \text{with } i = 1, \dots, n. \quad (1)$$

The following theoretical plausible restrictions are imposed on the structure of the model to identify various structural shocks.

$$\begin{bmatrix} e_{GDP} \\ e_{TFCE} \\ e_{GDCF} \\ e_{EXPORTS} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ C_1 & 1 & 0 & 0 \\ C_2 & C_3 & 1 & 0 \\ C_4 & C_5 & C_6 & 1 \end{bmatrix} \times \begin{bmatrix} \varepsilon_{GDP} \\ \varepsilon_{TFCE} \\ \varepsilon_{GDCF} \\ \varepsilon_{EXPORTS} \end{bmatrix}$$

The optimal lag length based on various criteria (such as LR test statistic, final prediction error criterion, and akaike information criterion) was found to be three quarters (Table 4).

Table 4: VAR Lag Order Selection Criteria				
Endogenous variables: DLGDP_SA DLTFCE_SA DLGDCF_SA DLEXPORTS_SA				
Exogenous variables: C DLUSGDP_SA DUMMY				
Date: 06/25/11 Time: 14:41				
Sample: 1996Q1 2009Q4				
Included observations: 51				
Lag	LogL	LR	FPE	AIC
0	404.8589	NA	2.40e-12	-15.40623
1	422.1351	29.80989	2.29e-12	-15.45628
2	439.8968	27.86159	2.19e-12	-15.52537
3	463.3154	33.06148*	1.71e-12*	-15.81629*
4	475.6604	15.49183	2.13e-12	-15.67296
* indicates lag order selected by the criterion				
LR: sequential modified LR test statistic (each test at 5% level)				
FPE: Final prediction error				
AIC: Akaike information criterion				
SC: Schwarz information criterion				
HQ: Hannan-Quinn information criterion				

Our S-VAR model is uniquely identified and shocks are orthogonal (uncorrelated). The matrices with estimated parameters are presented below (Table 5).

Table 5: Matrices with estimated parameters			
Estimated A matrix:			
1.000000	0.000000	0.000000	0.000000
-0.678605	1.000000	0.000000	0.000000
-3.447036	1.389381	1.000000	0.000000
-2.044768	0.930826	0.276871	1.000000
Estimated B matrix:			
0.010991	0.000000	0.000000	0.000000
0.000000	0.022351	0.000000	0.000000
0.000000	0.000000	0.063236	0.000000
0.000000	0.000000	0.000000	0.054538

In a VAR framework, variance decomposition analysis shows the proportion of variability of each variable on the part of variability of that resulted from the shock in the variable itself as also shocks in other variables. Variance decomposition for the basic S-VAR model for a period of one quarter to 5 years is shown (Table 6). The proportion by which the variance share of forecasting error is explained by the actual variables decreases over time. The results of variance decomposition for GDP and TFCE show that after a quarter, these variables explain about 90% of the variance of their forecasting errors. On the contrary, EXPORTS and GDCF explain about 85% and 70% of the variance of their forecasting errors after a quarter, reflecting their dependence on other variables. In case of GDCF, after a quarter, nearly 30% of the variance of its forecasting error is explained by TFCE and GDP, reflecting the high dependence of the former on the latter variables. This reflects the dependence of investment activity on GDP and TFCE as the growth in the latter two variables cause investment activity to pick-up as India is a supply-constrained economy. In case of exports, after three quarters, nearly 13% of variance in exports is explained by the GDP, reflecting the dependence of exports on the latter so that in the supply constrained economy, higher output props up exports.

Table 6: Variance decomposition of the S-VAR Model

GDP					
Quarters	S.E.	e^{GDP}	e^{TFCE}	e^{GDCF}	e^{EXPORTS}
1	0.010991	100.0000	0.000000	0.000000	0.000000
5	0.012870	75.81393	19.46484	2.074185	2.647044
10	0.013009	75.00001	19.51026	2.755009	2.734718
15	0.013028	74.82684	19.67076	2.769943	2.732459
20	0.013030	74.81565	19.67987	2.772008	2.732476
TFCE					
Quarters	S.E.	e^{GDP}	e^{TFCE}	e^{GDCF}	e^{EXPORTS}
1	0.010991	10.02037	89.97963	0.000000	0.000000
5	0.012870	10.72765	74.62810	13.29445	1.349797
10	0.013009	11.15202	74.52332	12.95384	1.370827
15	0.013028	11.15169	74.48555	12.99258	1.370175
20	0.013030	11.16362	74.47698	12.98982	1.369570
GDCF					
Quarters	S.E.	e^{GDP}	e^{TFCE}	e^{GDCF}	e^{EXPORTS}
1	0.010991	13.24251	16.85670	69.90079	0.000000
5	0.012870	11.95492	22.32191	58.98503	6.738144
10	0.013009	12.04595	25.66771	55.95567	6.330680
15	0.013028	12.17914	25.99778	55.54137	6.281711
20	0.013030	12.19247	26.02948	55.50084	6.277217
EXPORTS					
Quarters	S.E.	e^{GDP}	e^{TFCE}	e^{GDCF}	e^{EXPORTS}
1	0.010991	1.791952	4.266357	8.776957	85.16473
5	0.012870	12.45128	8.588427	7.256644	71.70365
10	0.013009	12.36987	10.04075	8.376386	69.21299
15	0.013028	12.40841	10.24158	8.394798	68.95521
20	0.013030	12.41003	10.24781	8.3978578	68.94430

Standard impulse response functions describe the response of the system to an exogenous shock, with paths of all the variables endogenously determined. Solid lines represent the function, while the dashed lines represent two standard deviations. While the abscissa shows time expressed in quarters, the ordinate shows the level phenomena expressed in units of measurement. All the shocks were found to asymptotically die out to zero (Figure 10). A shock in consumption expenditure was found to positively impact GDP for four quarters. A shock to

capital formation was found to have a positive impact on GDP for five quarters. A shock in exports is found to cause a decline in GDP for three quarters.

<Insert Figure 10 here>

In case of exports, a positive shock to GDP props up exports for four quarters and the positive impact persists for times ahead reflecting the fact in a supply constrained economy like India higher output props up exports (Figure 11). This is also validated by VAR granger causality test, which establishes a causality working from GDP to exports (Table 7). The stability condition, which indicates that all roots of the characteristic polynomial are inside the unit circle, is satisfied, so the defined VAR model is stable (Figure 12).

Table 7: VAR Granger Causality/Block Exogeneity Wald Tests				
<i>Null Hypothesis</i>	<i>Chi-Sq</i>	<i>Df</i>	<i>Probability</i>	<i>Conclusion</i>
Exports does not granger cause GDP	0.7327	1	0.3920	Accepted
GDP does not granger cause Exports	9.9709	1	0.0016	Rejected

<Insert Figure 11 here>

<Insert Figure 12 here>

VIII. Concluding Observations:

From the foregoing analysis, it is found that global financial crisis had an adverse impact on India's trade. India's export sector got impacted by the weakening of global economic activity, and more by the slowdown of the US economy. Though India's external sector has been badly hit, fall in export growth of the India's exports was lower than the fall in export growth of some of the advanced economies as well as some of the EMEs because of relatively lesser openness of Indian economy *vis-à-vis* these other economies. Disaggregated analysis of India's export sector suggests that slowdown in exports was, by and large, spread across all the sectors.

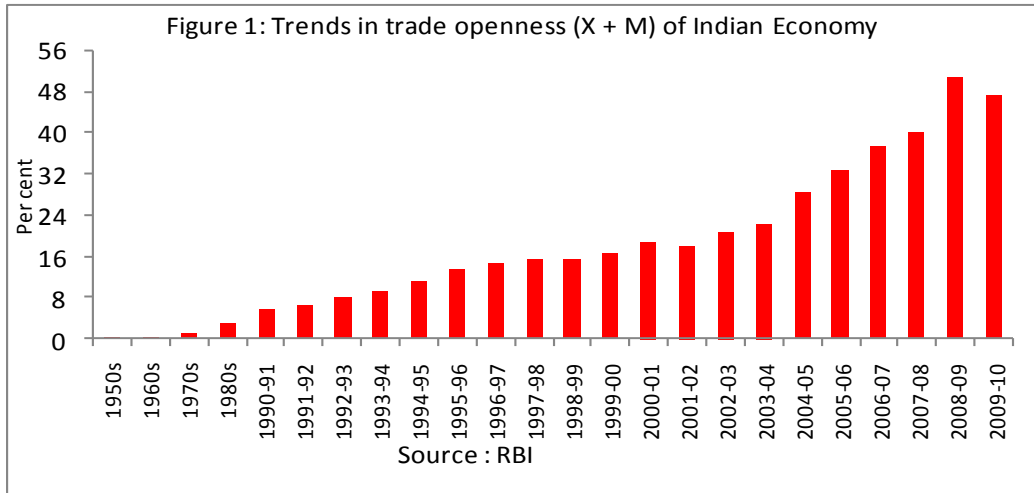
Relatively low technology and labour-intensive sectors, viz., gems and jewellery, textiles and textile products, suffered the most in terms of job-lessness. In the S-VAR framework, in the impulse response analysis, all the shocks were found to asymptotically die out to zero. A shock in consumption expenditure was found to positively impact GDP for four quarters. A shock to capital formation was found to have a positive impact on GDP for five quarters. A shock in exports is found to cause a decline in GDP for three quarters. On the whole, it is found that the adverse impact of global shocks on Indian economy persisted only for a brief while and as such it did not have a severe impact on India's GDP growth, which is primarily driven by domestic consumption, while external demand plays a minimal role.

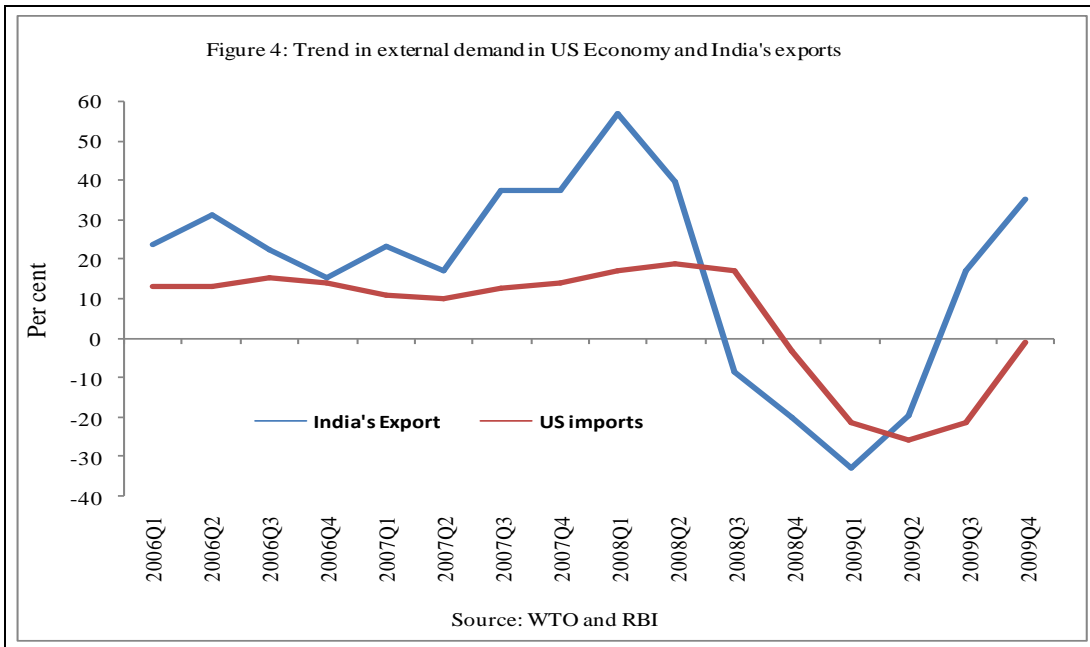
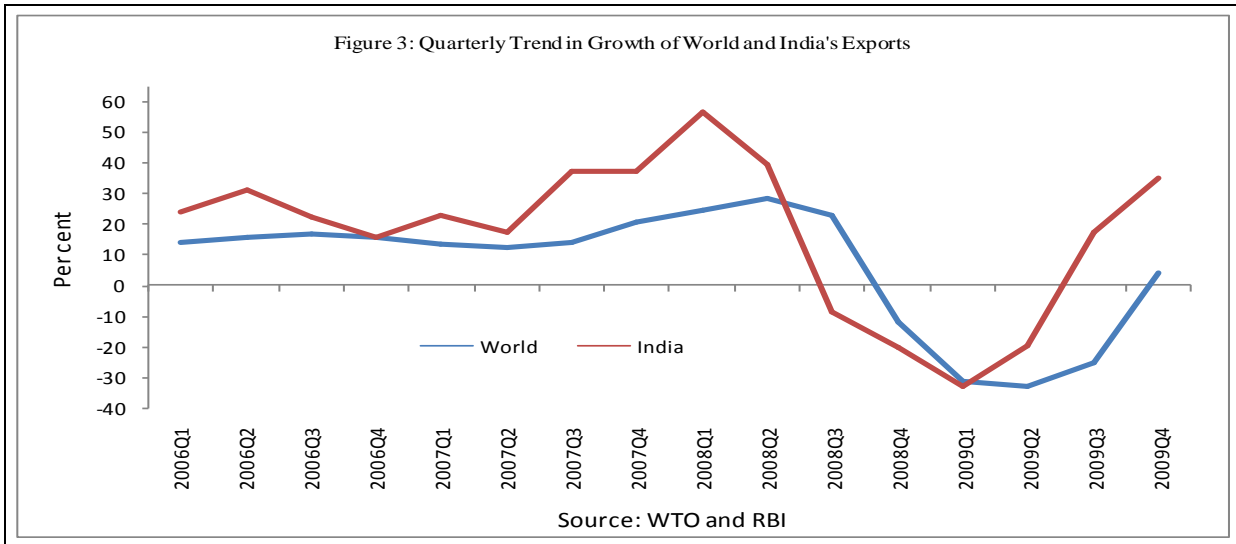
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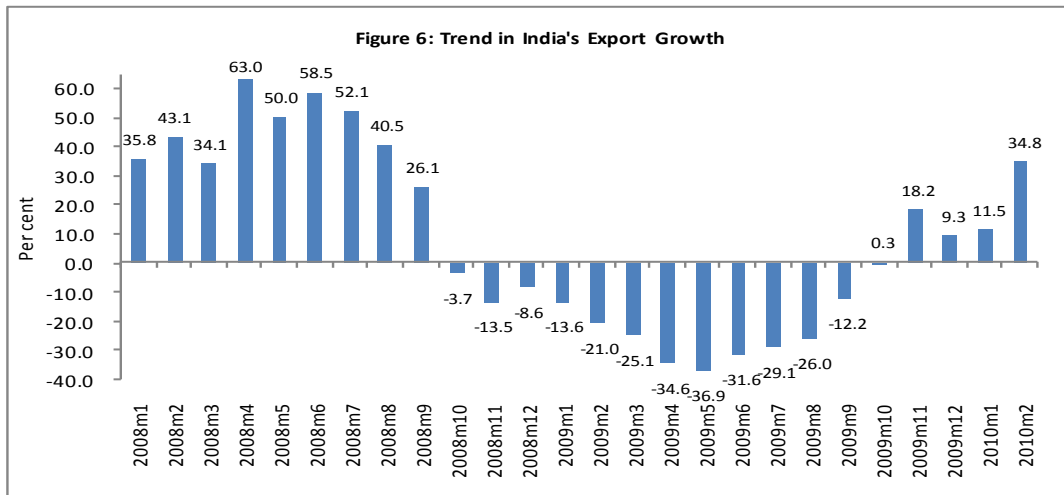
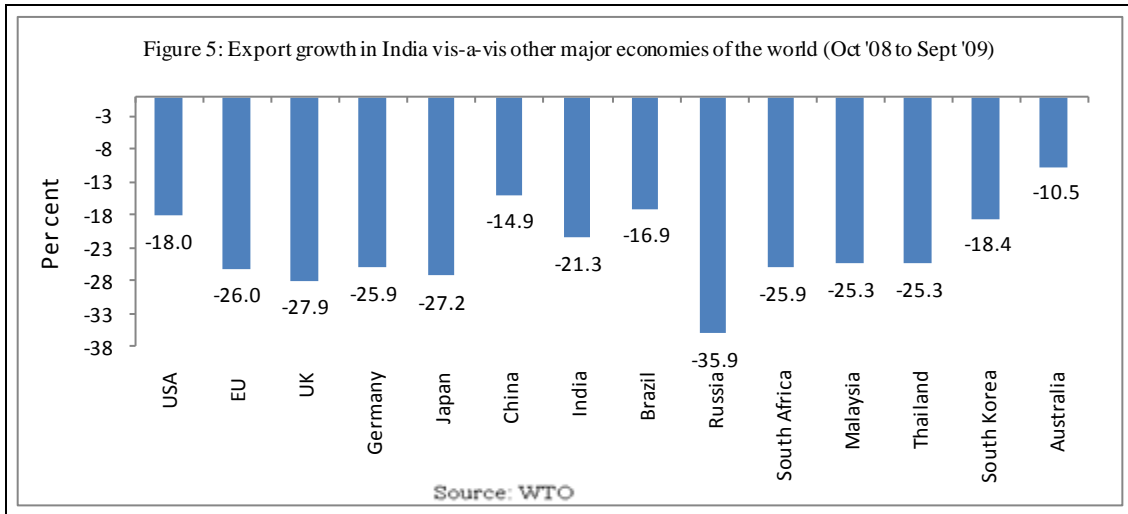
- Akin Cigdem (2006), "Multiple Determinants of Business Cycle Synchronization", February 10.
<http://economics.ca/2006/papers/0310.pdf>
- Artis, Michael and Okubo Toshihiro (2011), "Does International Trade Really Lead To Business Cycle Synchronization? - A Panel Data Approach", The Manchester School Special Issue: Business Cycle Behaviour in Historical Perspective , Volume 79, Issue 2, 318–32, March.
- Eichengreen, B., Rose, A., Wyplosz, C (1996), "Contagious currency crises". *Scandinavian Economic Review*, 98 (4), 463–484.
- Eichengreen, Barry and Andrew Rose (1999), "Contagious currency crises: Channels of Conveyance." In Takatoshi Ito and Anne Krueger, eds. *Changes in Exchange Rates in Rapidly Developing Countries: Theory, Practice, and Policy Issues*. Chicago: University of Chicago Press, 29-50.
- Fidrmuc Jarko and Korhonen Iikka (2009), "The Impact of the Global Financial Crisis on Business Cycles in Asian Emerging Economies", CESIFO Working Paper No. 2710, Category 7: Monetary Policy and International Finance, July.
- Fidrmuc, Jarko and Iikka Korhonen (2010), "The impact of the global financial crisis on business cycles in Asian emerging economies", *Journal of Asian Economics*, 21 (2010) 293–303
- Forbes, Kristin J. (2001), "Are Trade Linkages Important determinants of country vulnerability to Crises", *NBER Working Paper* 8194, March.
- Frankel, J. A., Rose, A. K. (1998). "The Endogeneity of the Optimum Currency Area criteria", *Economic Journal*, 108, 1009-25.
- Glick, R., Rose, A (1999), "Contagion and trade: why are currency crisis regional", *Journal of International Money and Finance*, 18 (4), 603–617.
- Government of India, "Report on Quarterly Employment Survey", various issues, Ministry of Labour and Employment, Labour Bureau.
- Harrigan, James (2000), "The impact of the Asia Crisis on US Industry: An Almost Free Lunch?", *Federal Reserve Bank of New York Economic Policy Review* 6(3): 71-79.
- International Monetary Fund, Website: <http://www.imf.org>.
- Jansen, Marion and Erik Von Uexkull (2010), "Trade and Employment in the Global Crisis", International Labour Organisation, Geneva.
- Kaur, Gunjeet, *et. al.* (2008). "Some Perspectives on the Possible Impact of the Recent Financial Turmoil in the Global Financial Markets on the Indian Economy", RBI Staff Studies, S S (DEAP): 2/2008, May.

- Lakshmanan L., S. Chinnghaihan and Raj Rajesh (2007), “Competitiveness of India's Manufacturing Sector: An Assessment of Related Issues”, *Reserve Bank of India Occasional Papers*, Vol. 28, No. 1, Summer 2007.
- Mason, Paul. (1998), “Contagion: Monsoonal Effects, Spillovers, and Jumps Between Multiple Equilibria”, International Monetary Fund Working Paper No. WP/98/142.
- Mohanty, Deepak (2010), “Global Financial Crisis and the Indian Economy”, *RBI Monthly Bulletin*, November, 2331-40
- Reserve Bank of India (2009), Annual Report, 2008-09.
- Reserve Bank of India (2009), Handbook of Statistics on the Indian Economy 2008-09.
- Reserve Bank of India (2010), Report on Currency and Finance, 2008-09.
- Srinivasan, T.N. (1998), “India's Export Performance – A Comparative Analysis” in Ahluwalia, I.J. and I.M.D. Little (Eds.) *India's Economic Reforms and Development: Essays for Manmohan Singh*, New Delhi, Oxford University Press.
- Van Rijckeghem, C., Weder, B. (1999), “Sources of contagion: finance or trade?”, IMF Working Paper 99/ 143.
- Virmani, A. (1991), “Demand and Supply Factors in India's Trade”, *Economic and Political Weekly*, 26 (6) February.
- World Trade Organization, Website. <http://www.wto.org>.

Figures







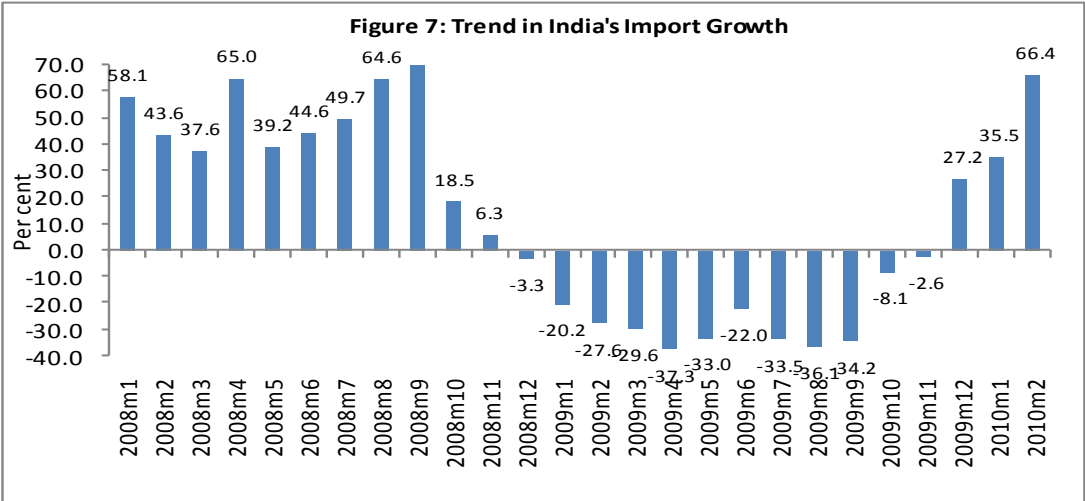


Figure 8: Diagrammatic Representation of Transmission of Crisis through Trade Channel and its Impact

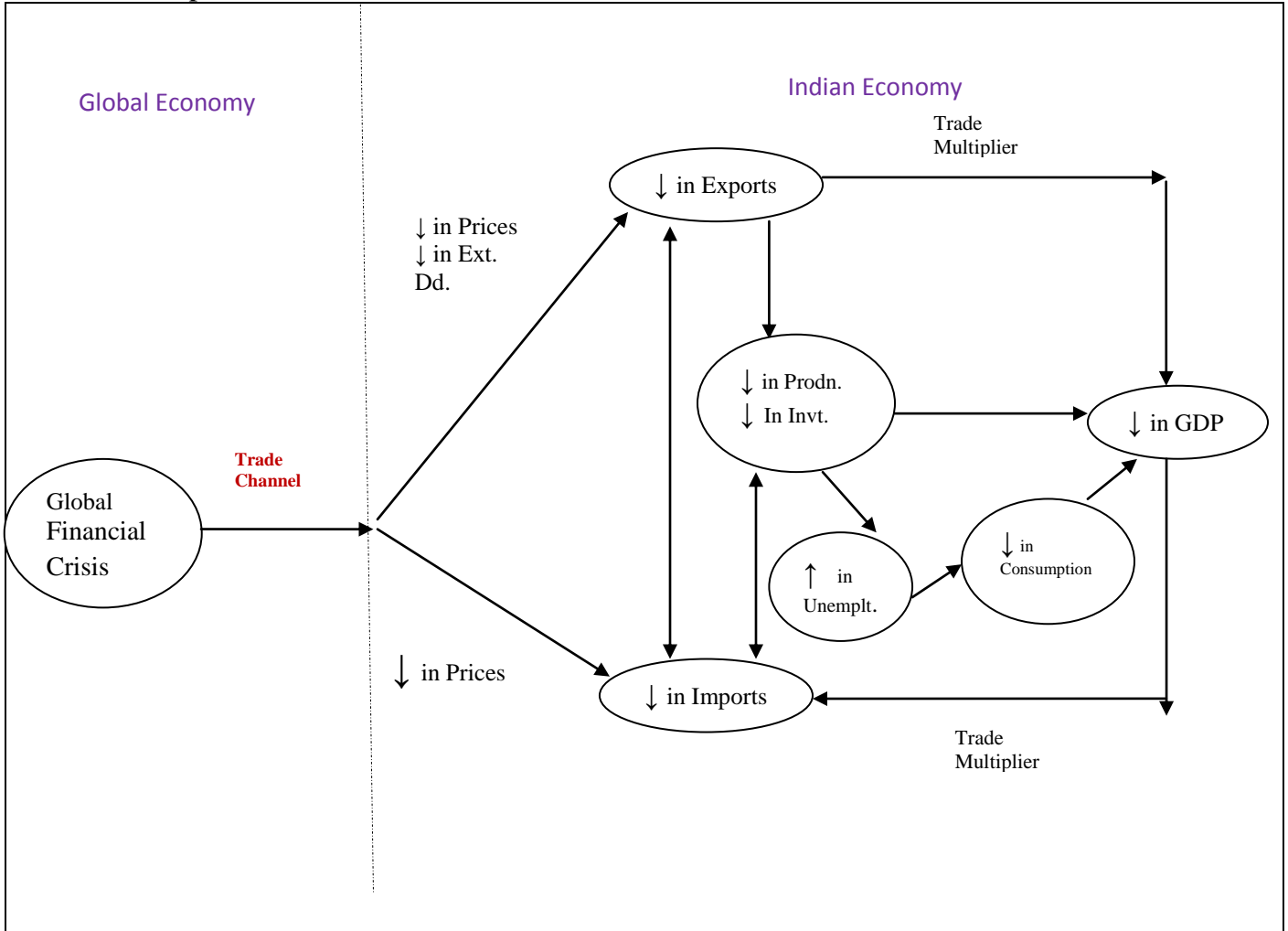
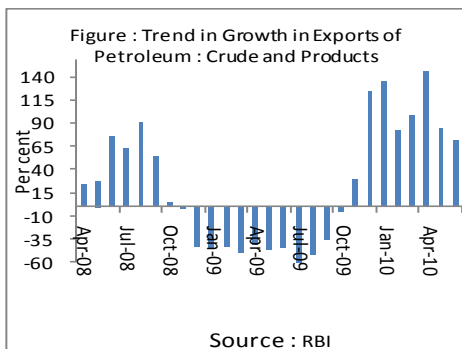
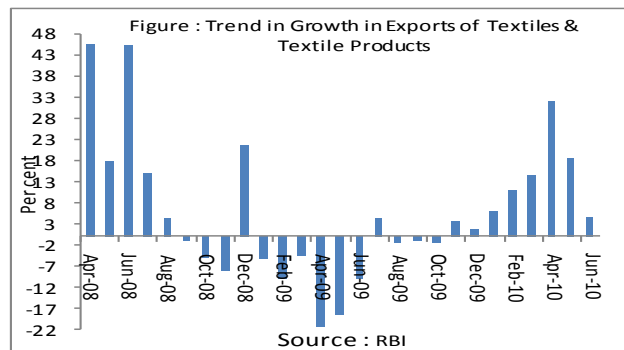
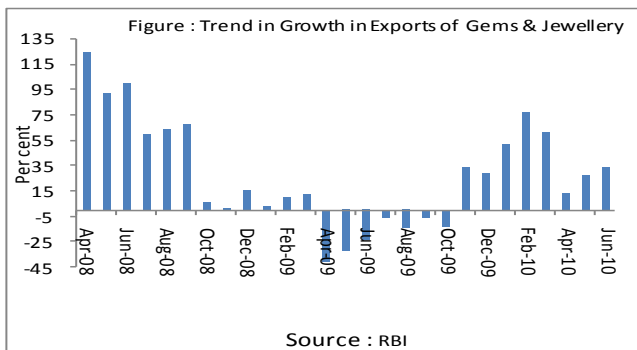
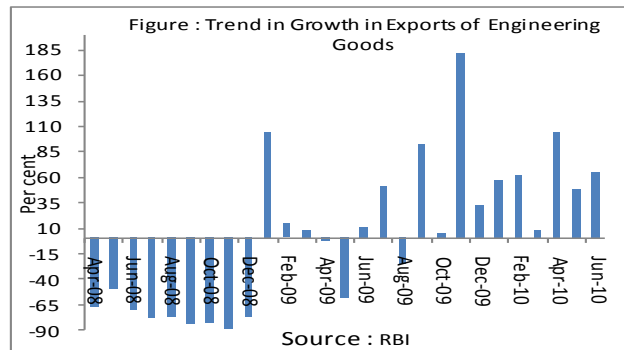
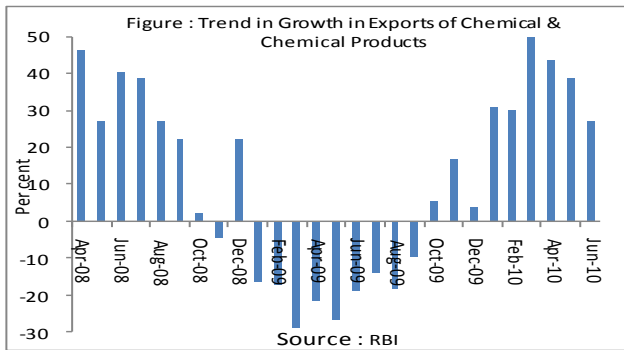
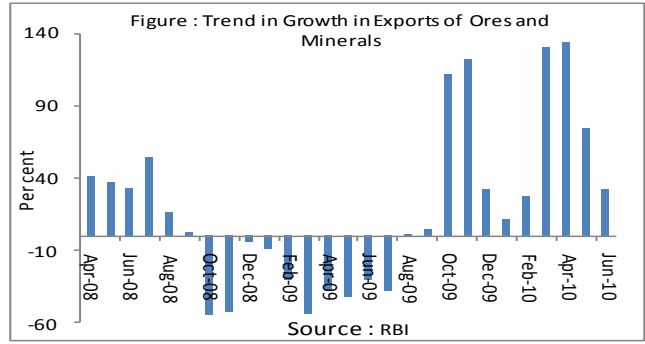
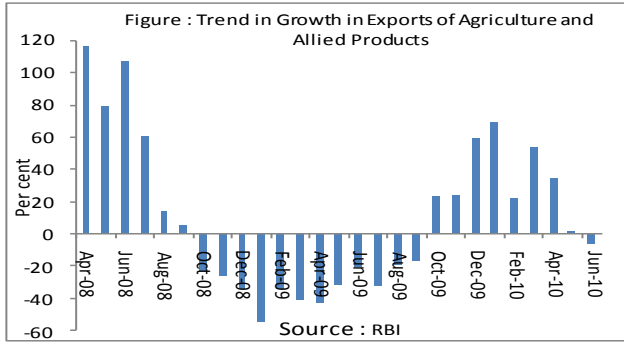


Figure 9: Trend in Growth in Exports of Select Export Items



Source: RBI.

Figure 10: Impulse Response Analysis

Response to Cholesky One S.D. Innovations ± 2 S.E.

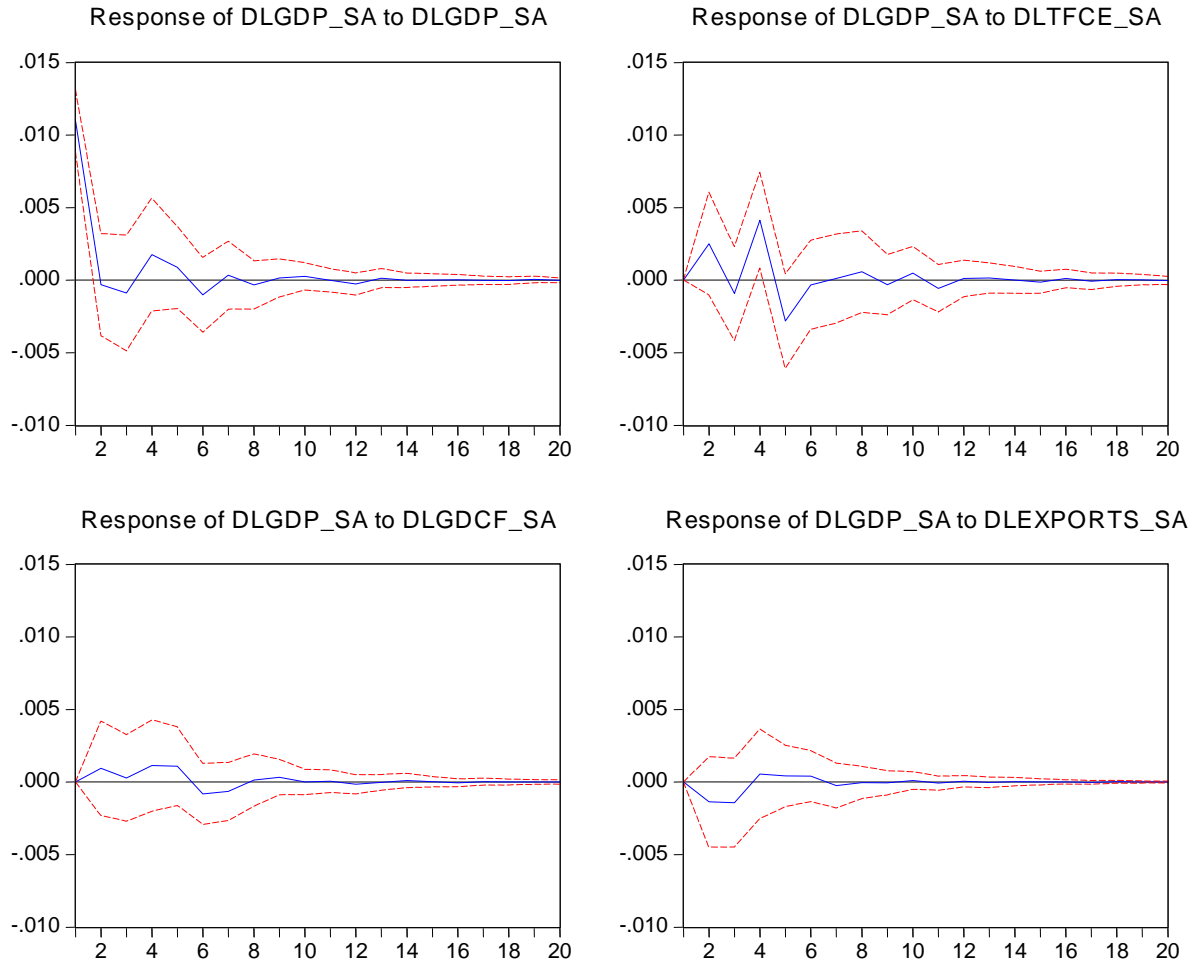


Figure 11: Impulse Response Analysis

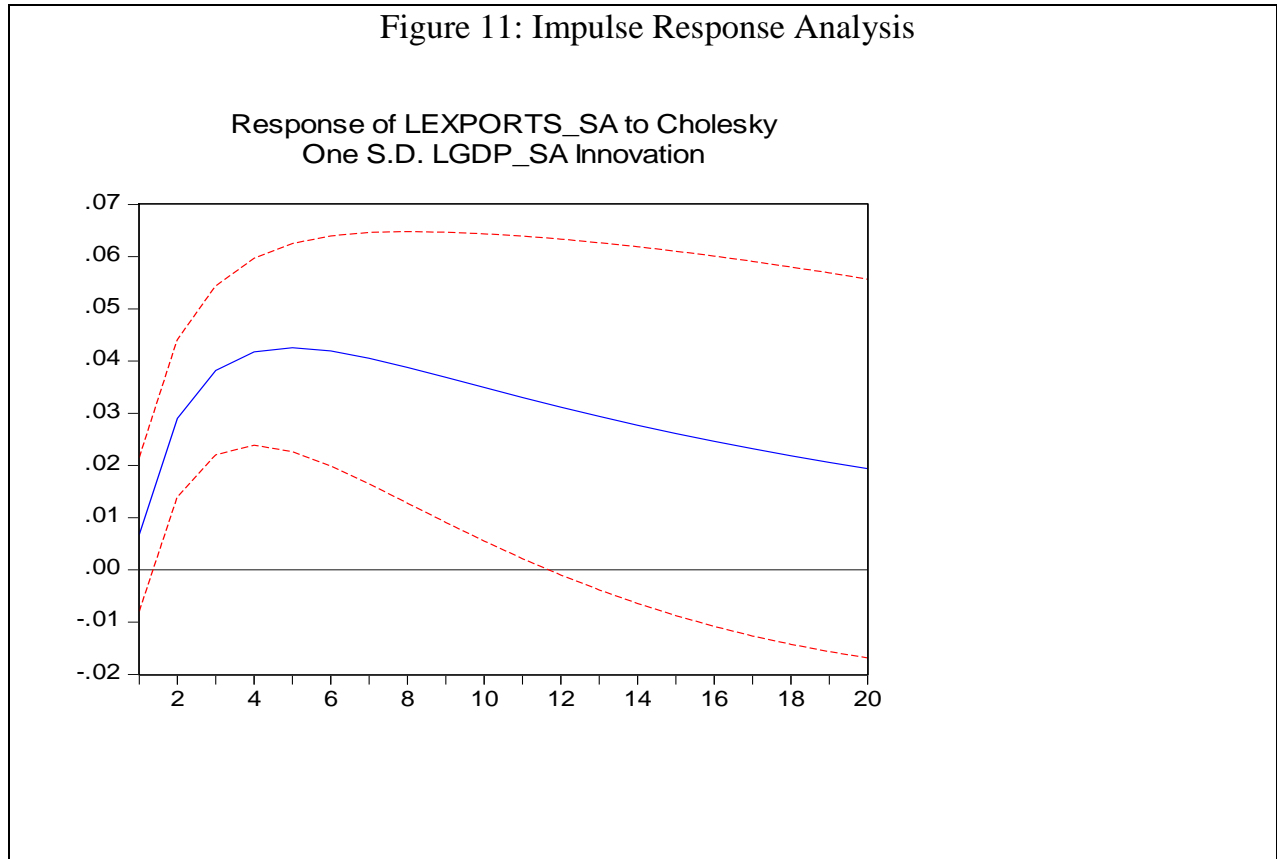


Figure 12: Inverse roots of characteristics polynomial

